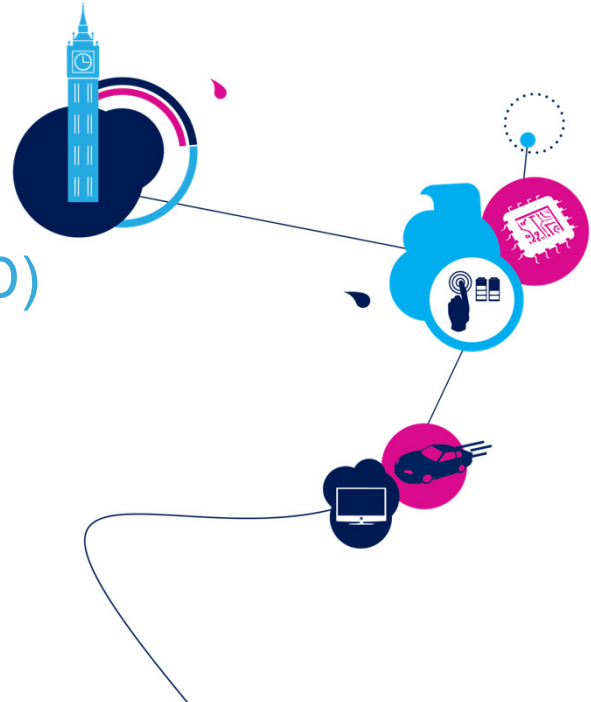


# Industrial & Power Discrete (IPD)

**Carmelo Papa**  
Executive Vice President  
General Manager, Industrial and Multisegment Sector

**Matteo Lo Presti**  
Group Vice President  
General Manager, Industrial and Power Conversion Division



## IPD at a Glance

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### 2012 key facts

- TAM = \$ **33.1B**
- Billing = \$ **1.75B**
- Market share = **5.3%**



### A significant breakthrough in Innovation

- **> 700** new products introduced in the last two years
- **16%** of sales are products < 2 years old
- **> 290** new patents and patent applications (filed or granted) in 2012

### Diversified product portfolio embedding Power, Smart Power and Analog ICs

- ... more than **7,300** available products

### Serving a large and balanced customer base: OEMs, Distributors and Mass Market Accounts

- **> 5,800** final customers supported

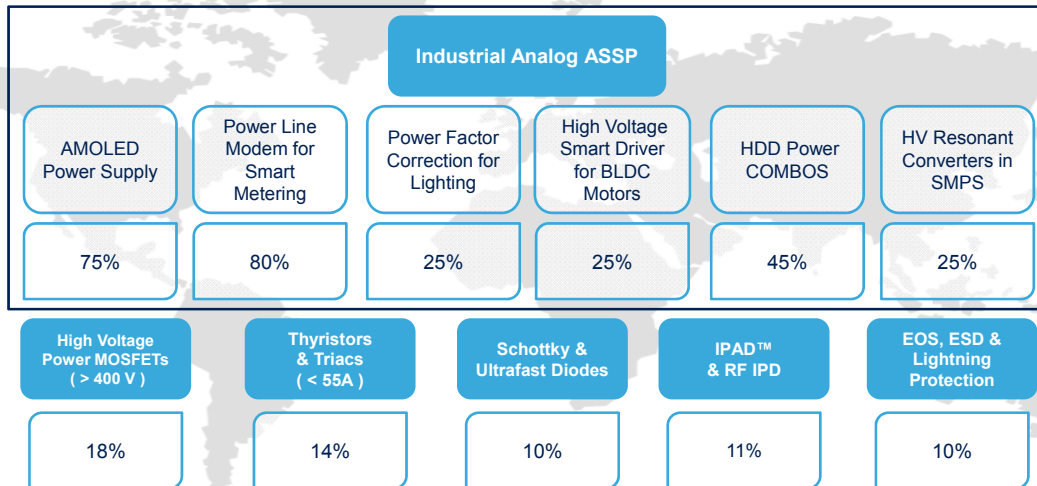
Wide mix of Technology (HCMOS9, Power, BCD), IPs, SW and Packages supporting product roadmap evolution



Source: WSTS, ST

# Market Leader in Power & Smart Power

3

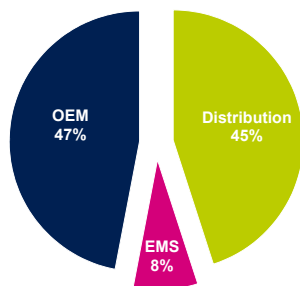


Source: WSTS, IHS iSuppli, ST

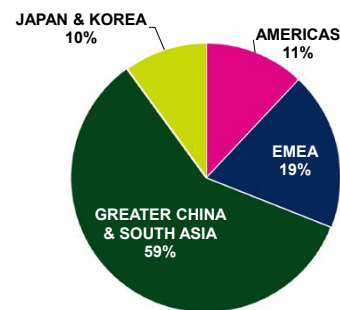
# Well Balanced Customer Base...

4

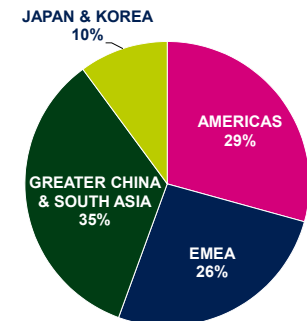
Revenue by customer type



Revenue by region of shipment



Revenue by region of origin



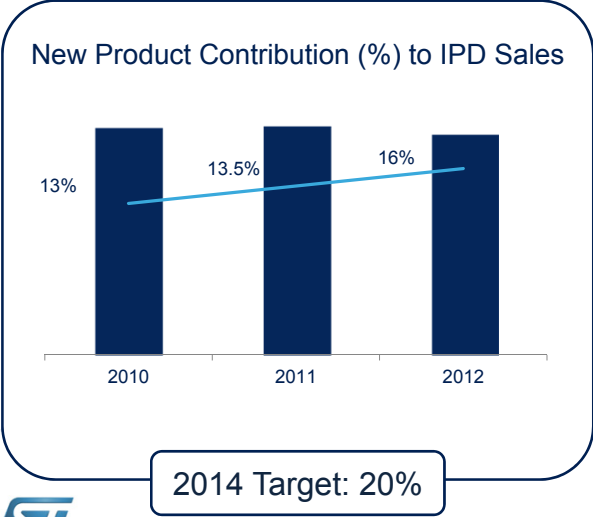
...and well balanced across Market Segments



Source: ST

# New Products: a Key Contribution to Sales

5



Long lasting product portfolio for Industrial Applications

Competitive Design & Manufacturing process

23 new Key Power & Smart Power technologies introduced in the last 2 years

Large Power, Analog & Digital IP portfolio for developing Advanced Smart Power products

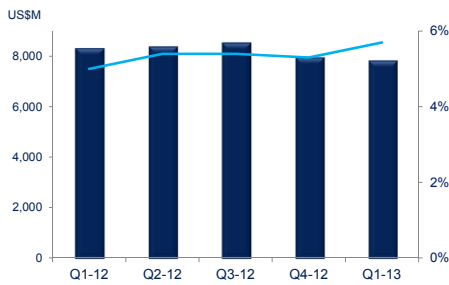
Power Packages enabling high power applications and power density optimization

Source: ST

# IPD: 2012 Results & TAM Evolution

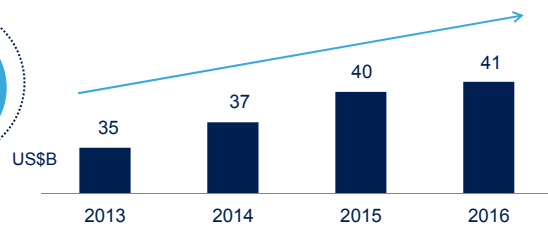
6

TAM & IPD Market Share



6% CAGR 2013-16

IPD TAM



## Key Products Focus

- Power Management ICs for Smartphones and Tablets
- Industrial ASICs and ASSPs for factory automation and motion control
- IGBT Power Modules for industrial applications
- Tunable Capacitors for mobile phones
- SiC Diodes for high power converters



Source: WSTS, ST

# Key Market Trends & Focus Areas

7

## Smart Grid



\$6B TAM in 2016  
CAGR 13-16: +14.2%

### Key Applications:

Smart Metering, Renewable Energy, Energy Saving, Power Conversion, HEV-EV, LED Lighting

## Automation



\$8B TAM in 2016  
CAGR 13-16: +7.5%

### Key Applications:

Factory Automation, Industrial Motor Drives, Home & Building Automation, Networking, Security

## Portable



\$9B TAM in 2016  
CAGR 13-16: +7.4%

### Key Applications:

Smartphone, Tablet, Handheld Consumer, Fitness, Consumer Medical



Source: IHS iSuppli, Semicast, ST

# Recent Major Achievements in Portable

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## Portable

### AMOLED Displays ICs:

Ensuring longer battery life and high immunity to cellphone communication noise, resulting in flicker-free displays

- > 75% Market Share
- Now expanding into TV display applications

### Integrated Passive & Active Devices (IPAD):

combining multiple functions in a single tiny package

- Won new socket at major Chinese smartphone makers

### High-Speed Electrostatic-Discharge Protections:

Increasing application robustness & reliability

- Collected multiple design wins in mobile phones and tablets, TV displays, PCs and laptops at major global OEMs

### High Voltage MOSFET:

Extending product range for battery chargers for smartphones and tablets

- > 400% sales growth in 2012 vs. 2011 with new MOSFET technology in major smartphone manufacturers



# Recent Major Achievements in Automation

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## Automation

### Motion Control ICs:

Unrivaled integration with Smart Power technology

- **x-SPIN™** family doubling sales in last 3 years
- Introduced new Technology Platforms for **Micro-Stepping & Multi Motor Drivers**, allowing penetration into new, high margin Industrial applications (representing 30% of the Market)

### SmartDRIVE™:

Advanced solution for robust and high efficient driving of **IGBT/MOS**

- SmartDRIVE product family sales growing by 120% in the last 3 years in Home Appliances (market growing by 10% per year)

### EOS & ESD Protection:

for Ethernet & Security Networks

- New design wins will double ST 2013 revenues vs. 2012

### IGBT/MOSFET Power Modules:

Integrated & efficient modules for flexible & robust designs

- Won socket for **SLLIMM** (IPM) Intelligent Power Modules in high-end washing machines at a leading European household appliance maker & at US white goods manufacturers
- First custom product sockets won at Industrial customers for High Power Conversion and Motion Control



# Recent Major Achievements in Smart Grid

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## Smart Grid

### Power Line Communication:

Undisputed Leadership with **STarGRID™** Platform

- 80% market share in power line modem for Smart Metering
- 120% sales growth 2012 vs. 2010

### Power Conversion:

ICs for Energy Saving

- Increase market penetration thanks to strong relationship with OEM and know-how reuse in new ASSP for open market

### HV Power Discrete and Smart Power:

For Energy Management

- **Super Junction MOSFET** sales growth +7 % in 2012 vs. 2011 representing 61% of High Voltage sales in 2012
- Secured design wins for the robust **Trench-Gate Field-stop IGBTs** with several solar-power and welding customers in Europe and China
- Introduction of Power Transistors and ICs for HEV Application: design won with Key OEMs



# IPD: Priorities for 2013

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2013

Expansion of **Low Voltage MOSFET** and **IGBT** (including modules) addressing Industrial, Telecom, and Automotive applications

Major turnaround in the **distribution & mass market**, following tough market conditions in 2012

Introduce innovative solutions in **Power Management for Portable Equipment**, exploiting ST-Ericsson resources, know-how and IPs



New Technologies and Advanced Products to Serve the Market



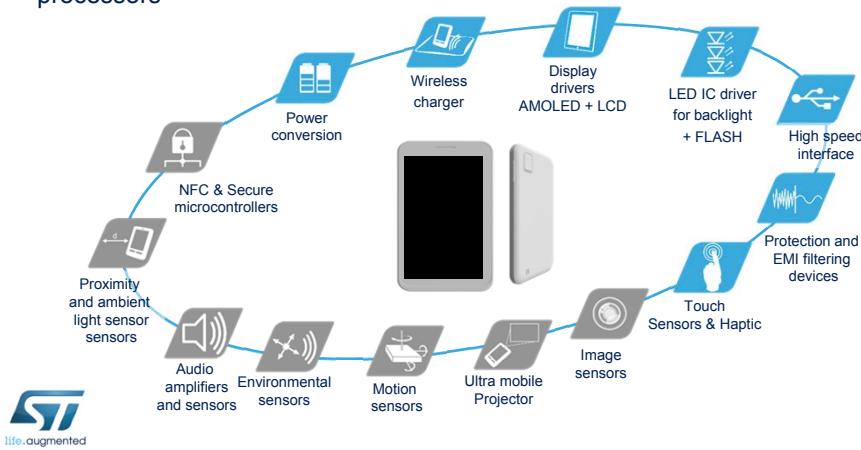


Portable

## Expanding Leadership in Power Management ICs for Smartphones & Tablets

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Complete application know-how and broad IP portfolio for integrated solutions: from **AMOLED DC/DC** to **Power Management Integrated Circuit (PMIC)** for application processors



WW Smartphone & Tablets  
CAGR 13-16: >15%  
2016 TAM: >1.5 Billion units

Source: Displaybank (IHS) 2012



Portable

## Entering New Areas for Discrete Power & Antenna Tuners

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**Smart RF Antenna Tuners:** Introducing high-performing, power-saving Tunable Capacitors for new generation 4G LTE devices for leading smartphone manufacturers

- Mobile Phone antenna is matched by design (GSM or 3G) and/or configuration ("in hand" or "free space")
- ST tunable solution adapts the antenna impedance to various modes and preset configurations in order to Boost 4G Connections & Battery Life
- Enhancing the transfer of energy from the handset amplifier to the antenna under various operating conditions



Longer Battery Life



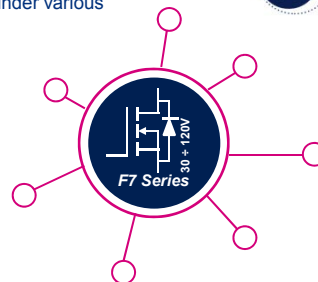
Fewer Dropped / Missed calls



Faster data-rate

Expanding our Market Leadership from high voltage to low voltage **Power Transistors**

- Power MOSFET low conduction losses & efficient intrinsic body diode allow package miniaturization & small form factor of final system





# New Paradigm in Digital Power Supply

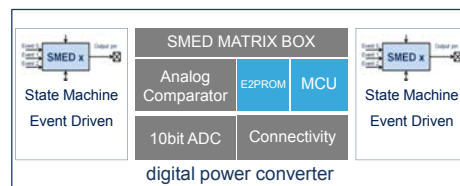
**STLux:** The first digital platform specifically for power conversion.

**Main Advantages:**

- Topology independent solution
- Control, communication and monitoring functions
- Thermal management
- Easy to program, easy to use
- Very high efficiency with control algorithm adapted to load conditions

**Improved reliability:**

- Fault detector, precursor & recorder



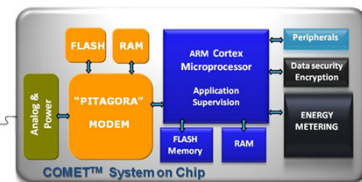
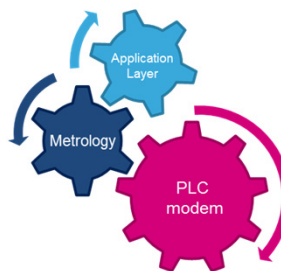
**ST Market Leadership in Analog Power Management will expand to Digital Power Management**



# Advanced Products for Metering Applications

**Power Line Communication**

- From first smart PLC modem generation to super integrated 5th generation SoC platforms
- Unique System on Chip architecture with highest integration for emerging Smart Grid applications
- Integrated: PLC Module, Metrology Engine and Application Core



**New Meter Analog Front End**

- Programmable SoC energy calculator
- Configurable DSP energy calculator with Multiple Channels AFE



WW installed Smart Meters  
CAGR 2011-17: 33%  
from 97 Million  
to 544 Million







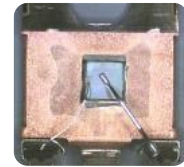
Smart grid

# Advanced Power Discrete

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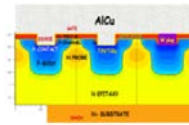
## SiC and GaN

- 600/650V SiC Diode already in mass production
- 1200V SiC Diode available
- 1200V SiC MOSFET (Planar Technology) available in 3Q13
- 650V / 200A HEMT GaN Transistor under development
- 600V GaN Power Diodes available next year



## AFER Diodes

- Low Vf providing an immediate 1% efficiency improvement
- Low Ir providing extra margin against thermal runaway
- Perfect price/performance positioning between Schottky & standard rectifiers



# Advanced Power Discrete

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## IGBT

- Trench Field Stop technology: the most advanced IGBT technology, offering 50% better efficiency than planar technologies
- 1200V Trench Field Stop thin wafer for better thermal characteristics and Power Module applications
- 650V / 200A Trench Field Stop IGBT for HEV and high-end Motor Control Applications

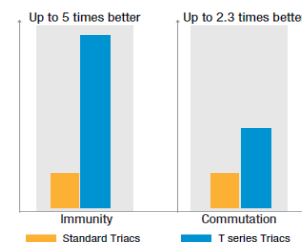


## Power Modules

- High Power Modules for industrial and automotive applications
- Proprietary ST packages: compact size and available in Solderable or PressFit Pins
- Improved thermal exchange
- Design for reliability

## Triacs New generation

- Better commutation (x3) and noise immunity (x5) vs. standard solutions



New Triac series features





# Advanced Smart Power

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## Intelligent Power Switches (IPS)

- Galvanic Isolation Break-through Technology for IPS
- Self protection and diagnostic
- Programmable devices with configurable output stages
- New product portfolio offering high integration and diagnostic for PLC, Digital I/O Systems
- Novel IO-LINK Transceivers for industrial networking

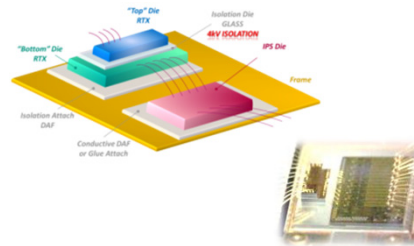


Elementary Coreless Transformer unit



## GapDrive

- Galvanic Isolated Gate Driver
- Serial Configuration / Monitoring
- High Current Driving capability
- Fault Protection
- Also addressing automotive applications



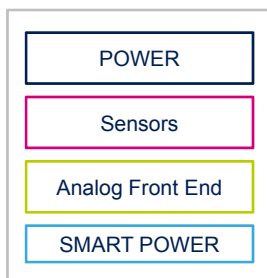
WW Growing TAM 2014: \$2B



Source: IHS Suppli, Strategy Analytics, ST

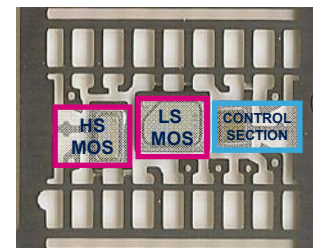
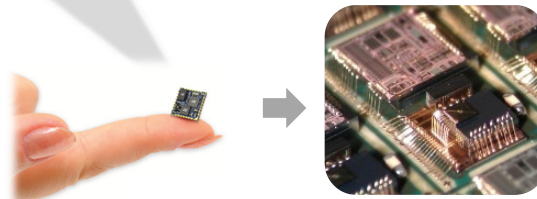
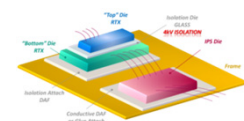
# Excellence in Analog & Power Mix through SiP

20



## Key Benefits

- Miniaturization
- Improve cost-effectiveness
- Enhance functionalities
- Protect IPs
- Power Density
- Flexibility
- Mix of hybrid technologies
- Heterogeneous integration



A combination of IPs and Technology for a Smart System-In-Package

# Focus on Mix and Profitability

21

- Targeting high-end growing markets
  - Smart Grid
  - Automation
  - Portable
- Improving product mix
  - Enriching **Power Discrete** product families by introducing SiC, GaN, High and Low Voltage MOSFET, FER Diodes.
  - Combining efficient **Power Technologies** (MOSFET, IGBT, SiC, GaN) **with Smart Power ICs** in Advanced Modules for Smart Grid, Automotive and Automation Markets
  - Entering **Digital Power Conversion** in High Performance and High Efficiency applications, supporting new stringent energy regulations
  - Expanding Smart Power Leadership entering in **Power Management ICs** for Smartphones and Tablets
- Leveraging on new resources transferred from ST-Ericsson to:
  - Reach a critical mass in the area of Power Management and Smart Power
  - Contribute to achieve the \$600-650M Net Opex target, thanks to repatriation of external development
- New products and focus areas will contribute to the improvement of Gross Margin and Operating Profit



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